TDC

Theater Deployable Communications

Baseline Requirements Document

Crypto Interface Module

CIM (v2.2)

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1.0 SCOPE

This requirements document establishes the performance, manufacture and test requirements for the TDC ICAP Crypto Interface Module v2.2.

2.0 APPLICABLE DOCUMENTS

To the extent specified herein, the following documents of latest current issue on the date of this Baseline Requirements Document form part of this BRD.

Table 1 - Standards and Applicable Documents

Document Number	Title
MIL-STD-810F	Environmental Test Methods
IEEE 802.3	Carrier Sense Multiple Access with Collision Detection (CSMA/CD) access method and physical layer specification.
IEEE 802.3 100BaseTX	100-Mbps baseband Fast Ethernet specification using two pairs of either UTP or STP wiring. 100BaseTX segment cannot exceed 328 feet (100 meters) in length.
IEEE 802.3 100BaseFX	100-Mbps baseband Fast Ethernet specification using two strands of multimode fiber-optic cable per link. 100BaseFX link cannot exceed 1312 feet (400 meters) in length.
TIA/EIA–422–B	Electrical Characteristics of Balanced Voltage Digital Interface Circuits (ANSI/TIA/EIA–422–B–94) (May, 1994)
EIA–530	High Speed 25 — Position Interface for Data Terminal Equipment and Data Circuit — Terminating Equipment, (June 1992)
EIA–232–E	Interface between Data Terminal Equipment and Data Circuit-Terminating Equipment employing serial binary data interchange (rates to 20 Kbps) (July 1991).
Cisco IOS Release Software and Features Pack	Cisco Systems Feature Set (describes features of Cisco Systems Routers)
409050501-0201	KIV-7HSB User's Manual, June 2001
24001109-000	CV-8448 NRZ to CDI Converters Operation & Installation Guide, Revision D
	TDC Standards Document

3.0 REQUIREMENTS

3.1 Module Definition

The Crypto Interface Module (v2.2) (CIM) provides data security for ICAP IP backbone and local network devices (hubs, switches, etc.) utilizing Internet Protocol (IP) to exchange data from nodes of the TDC ICAP and facilities external to the ICAP. The electrical interfaces available are 100BaseTX, 100BaseFX, high-speed synchronous serial (EIA–530), and Conditioned Diphase. Figure 1 shows a functional diagram of the CIM v2.2.

The Crypto Interface Module contains a Cisco 3745 modular router, which provides access to the ICAP IP backbone and serial trunk encryption devices to provide secure access for remote communications. The trunk encryption devices provide compatibility with KG–84 family (KG-84A, KG-84C, KIV–7) encryption devices. The Cisco 3745 card complement is listed in Table 16.

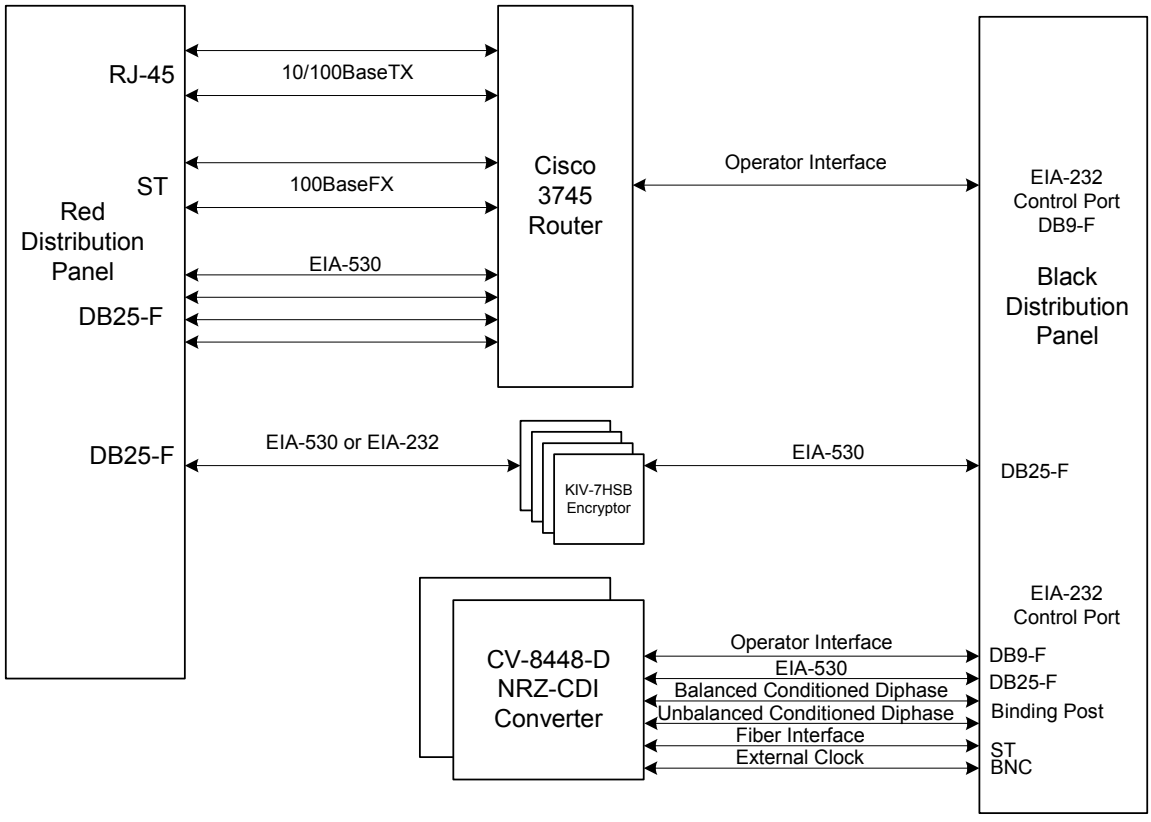


Figure 1 - Internal Functional Block Diagram

3.2 Performance Requirements

3.2.1 Electrical Interface Requirements (External)

The CIMv2.2 includes the number and type of external interfaces shown in Paragraph 2.

Table 2 - CIM External Interface Characteristics

Signal Name	Quantity	Connector	I/O	Internal Interface	Electrical Characteristics
Prime Power	1	IEC - 320 C-20 Receptacle	I	AC Power	100 to 240 VAC, 47 to 63 Hz
10/100BaseTX (0/0, 0/1)	2	RJ45	I/O	3745 10/100 LAN Port	IEEE 802.3
100BaseFX (1/0, 2/0 ST Fiber Optic Pair)	2pr	ST Fiber Optic	I/O	3745 NM-1FE-FX	IEEE 802.3
Serial Router Ports (3/0-3/3)	4	DB–25F	I/O	3745 NM-4T	EIA–530
KIV-7HSB Plain Text – Red Interface (1-4)	4	DB–25F	I/O	KIV-7HSB Red Interface	EIA–530
KIV-7HSB Cipher Text – Serial Data (1-4)	4	DB–25F	I/O	KIV-7HSB Black Interface	EIA–530
CV-8448-D Input – EIA-530 Serial Data (1-4)	2[1]	DB–25F	I/O	CV-8448-D NRZ	EIA–530
CV-8448-D Input External Clock In (1-4)	2[1]	BNC	I	CV-8448-D Ext Clk	Station Clock 1 /5 MHz or Bit Rate
CV-8448-D Output (CV-8448-D XMT, REC Ports)	2sets[1]	Binding Post (2 TX, 2 RX)	I/O	CV-8448-D CDI	Cond. Diphase Bal. or Unbal.
	2pr[1]	BNC	I/O	CV-8448-D CDI	CDI Unbalanced
	2pr[1]	ST Fiber Optic	I/O	CV-8448-D Fiber Optic	Proprietary Manchester encoded interface
Operator Interface – Configuration Ports (Router and CV-8448-D	2	DB-9F	I/O	3745 Router and CV-8448-D Converter	EIA–232
Crypto Fill Port	1	DS-101 or DS-102	I/O	KIV-7HSB	DS-101 or DS-102 Interface

Notes 1: The CV-8448-D can be mated to another CV-8448-D via an expansion port to form a four channel (4-PACK) configuration that may be controlled from a single terminal interface.

3.2.1.1 Prime Power

In accordance with the TDC standards document, the Crypto Interface Module operates from 100 to 130 VAC and 200 to 240 VAC, 50-60 Hz, single phase, and three-wire power. The Crypto Interface Module includes:

- An IEC–320 male connector (or equivalent) for prime power.
- An internal line transient suppressor to minimize line variations.

3.2.1.2 10/100BaseTX (0/0, 0/1)

These connections provide 100BaseTX connectivity to the data network. Each connector is an RJ45 modular female jack connector and pin assignments are in accordance with IEEE 802.3 for 100BaseTX Ethernet signals over Unshielded Twisted Pair (UTP) cable, as shown in Table 3.

Table 3 - RJ45 Connection Pinout for 10BaseT/100 Base TX Connector

Pin	Signal
1	TP0+
2	TP0-
3	TP1+
4	TP2+
5	TP2-
6	TP1-
7	TP3+
8	TP3-

3.2.1.3 100BaseFX (1/0, 2/0 ST Fiber Optic Pair)

The fiber Ethernet interface operates at a wavelength of 1300 nanometers. This connection provides 100BaseFX connectivity to the data network. The connector is a multimode fiber-optic cable with ST-type connector.

Protective covers are provided for all fiber connectors and cables. Keep these covers in place on any fiber Ethernet connectors or cables not in use to shield them from dust or damage, minimizing the potential for optical signal attenuation or data loss. Table 4 lists the fiber optic cable specifications.

Table 4 - ST Fiber Optic Connector Specification

100BaseFX -- ISO/IEC 9314-3
62.5 micron with a optical loss of no more than 9 dB

3.2.1.4 Serial Router Ports (3/0-3/3)

Interface connectors are DB–25 female receptacles. Pin assignments are in accordance with EIA–530 as shown in Table 5.

Table 5 - EIA-530 Synchronous Serial Data Interface

Pin	Signal	I/O	Pin	Signal	I/O
1	Shield	–	14	Transmit Data Return	O
2	Transmit Data	O	15	Transmit Clock	I
3	Receive Data	I	16	Receive Data Return	I
4	Request to Send	O	17	Receive Clock	–
5	Clear to Send	I	18	NC	–
6	Data Set Ready	I	19	Request to Send Return	O
7	Signal Ground	–	20	Terminal Ready	O
8	Receiver Ready (DCD)	I	21	NC	–
9	Receive Clock Return	–	22	Data Set Ready Return	I
10	Receiver Ready Return	I	23	Terminal Ready Return	O
11	Terminal Timing	O	24	Terminal Timing Return	O
12	Transmit Clock Return	I	25	NC	-
13	Clear to Send Return	I			

Note: I/O direction is with respect to the Router

3.2.1.5 KIV–7HSB Plain Text — Red Interface (1-4)

The connectors are a DB–25 female receptacles. Pin assignments are shown in Table 6. The KIV Red interface emulates a DCE.

Table 6 - KIV-7HSB Plain Interface

Pin	Signal	I/O	Pin	Signal	I/O
1	Shield	–	14	Transmit Data Return	I
2	Transmit Data	I	15	Transmit Timing	O
3	Receive Data	O	16	Receive Data Return	O
4	NC	–	17	Receive Timing	–
5	NC	–	18	NC	–
6	NC	–	19	NC	–
7	Signal Ground	–	20	NC	–
8	NC	–	21	NC	–
9	Receive Timing Return	–	22	NC	–
10	NC	–	23	Resync	I
11	Terminal Timing Return	I	24	Terminal Timing	I

Table 6 - KIV-7HSB Plain Interface

Pin	Signal	I/O	Pin	Signal	I/O
12	Transmit Timing Return	O	25	NC	-
13	NC	-			

Note: I/O direction is with respect to the KIV-7HSB

3.2.1.6 KIV–7HSB Cipher Text — Serial Data (1–4)

The KIV-7HSB Black interface connectors are DB–25 female receptacles. Pin assignments are shown in Table 7. The KIV interface emulates a DTE.

Table 7 - KIV-7HSB Cipher Text Interface

Pin	Signal	I/O	Pin	Signal	I/O
1	Shield	–	14	Transmit Data Return	O
2	Transmit Data	O	15	Transmit Timing	I
3	Receive Data	I	16	Receive Data Return	I
4	Request to Send	O	17	Receive Timing	–
5	Clear to Send	I	18	NC	–
6	Data Set Ready	I	19	Request to Send Return	O
7	Signal Ground	–	20	Terminal Ready	O
8	Data Carrier Detect	I	21	NC	–
9	Receive Timing Return	–	22	Data Set Ready Return	I
10	Data Carrier Detect Return	I	23	Terminal Ready Return	O
11	Terminal Timing Return	O	24	Terminal Timing	O
12	Transmit Timing Return	I	25	NC	–
13	Clear to Send Return	I			

3.2.1.7 CV-8448-D Input — EIA–530 Serial Data (1-4)

The CV-8448-D NRZ interface connectors are DB–25 female receptacles. Pin assignments are in accordance with EIA–530 as shown in Table 8.

Table 8 - CV-8448D EIA-530 Interface

Pin	Signal	I/O	Pin	Signal	I/O
1	Chassis GND	–	14	Transmit Data In -	I
2	Transmit Data In +	I	15	Transmit Clock Out +	O
3	Receive Data Out +	O	16	Receive Data Out -	O
4	NC	–	17	Receive Clock Out +	O
5	NC	–	18	NC	–

Table 8 - CV-8448D EIA-530 Interface

Pin	Signal	I/O	Pin	Signal	I/O
6	NC	–	19	NC	–
7	Signal Return	–	20	NC	–
8	DCD (CF) +	–	21	NC	–
9	Receive Clock Out -	O	22	NC	–
10	DCD (CF) -	–	23	NC	–
11	Transmit Clock In -	I	24	Transmit Clock In +	I
12	Transmit Clock Out -	O	25	NC	–
13	NC	–			

Note: I/O direction is with respect to the CV-8448-D

3.2.1.8 CV-8448-D Input — External Clock In (1-4)

When External Clocking is selected, the CV-8448-D module monitors and tracks an External Clock Source. This clock source is the NRZ operating rate or it can also be a station clock input of 1 or 5 MHz. When selected, all required clocks, both NRZ and CDI are developed from this source. The connectors for this interface are BNC.

3.2.1.9 CV-8448-D Output

The CV-8448-D provides Conditioned Diphase balanced or unbalanced output signals and fiber optic pair for connection to communications equipment. The optical ports support 62.5-micron multimode fiber.

3.2.1.9.1 Binding Post (CV-8448-D XMT, REC Ports)

Binding posts are provided to accommodate WF–16/U or equivalent field wire for connection to TRI-TAC communications equipment. The binding post interfaces support both balanced and unbalanced signaling.

3.2.1.9.2 BNC Connections

Four BNC coaxial connectors are provided to accommodate unbalanced CDI signals only. Interface to CX-11230 dual coax cables can be accomplished with user provided adapter cables.

3.2.1.9.3 ST Connections

Two pairs of ST optical connectors are provided to accommodate optical signals.

3.2.1.10 Operator Interface — Configuration Ports (ROUTER and CV-8448-D)

Operator Interface connectors are DB–9 female type. Users will access and configure the router and CV-8448-D converter using a VT–100 terminal or emulator.

- Router Characteristics:9600 baud, 8 data, no parity, 1 stop bit.
- CV-8448-D Characteristics:9600 baud, 8 data, no parity, 1 stop bit.

Pin assignments are in accordance with EIA–232 as shown in Table 9 in reference to a DCE interface.

Table 9 - Operator Interface Configuration Port

Pin	Signal	I/O
1	Data Carrier Detect	I
2	Receive Data	I
3	Transmit Data	O
4	Data Terminal Ready	O
5	Signal Ground	–
6	Data Set Ready	I
7	Request to Send	O
8	Clear to Send	I
9	NC	–

3.2.1.11 Crypto Fill Port

The KIV-7HSB fill interface is compatible with both DS-101 (AN/CYZ- 10 DID) and DS-102 (KYK-13, KYX-15, KOI-18) electronic keying, devices.

3.2.2 Electrical Interface Requirements (Internal)

The Crypto Interface Module utilizes several types of internal interfaces -- see Paragraph 6.3 for details.

3.2.3 Functional Requirements

3.2.3.1 Module Equipment Details

The following subsections provide details of the functionality of the major equipment of the Crypto Interface Module, as shown in Figure 1.

3.2.3.1.1 Cisco 3745 Modular Router

The router provides connectivity to the classified or unclassified ICAP IP backbone network for transport to exterior data networks. The Cisco 3745 router consists of the following interfaces:

- 2 fixed FastEthernet 10/100BaseTX ports built into the chassis (0/0, 0/1)
- 3 NM slots populated as follows:

- 2 single port 100BaseFX modules (1/0, 2/0), used to support two-multimode fiber optic ports
- 1 Four port serial network module used to support the Red Interface Panel Serial Router ports (3/0-3/3)

Further details for this router can be found at http://www.cisco.com/.

3.2.3.1.1.1 Router Software

The Cisco 3745 router is delivered with the Cisco Internetworking Operating System (IOS) with Enterprise PLUS IPSEC 3DES version 12.2(15) T5. This software set supports link encryption using commercial standards and forming of Virtual Private Networks (VPN) over the serial links. 32 MB of Flash and 128 MB DRAM memory comes standard to support the advanced features of the IOS. Additional information can be found at http://www.cisco.com/.

3.2.3.1.1.2 Router Administration

The Crypto Interface Module router is configured and managed via an external PC computer terminal emulation or a VT-100 terminal connected at the module's I/O DF, using 9600 baud, 8 data, no parity, 1 stop bit as the connection parameters. Access to the following functions is provided:

- Router configuration
- Router status

The router is also accessible via Telnet session over any IP connection (provided proper access is granted).

3.2.3.1.2 KIV–7HSB Encryptor

The KIV–7HSB encryption device provides data security to EIA-530, EIA–422/423 or EIA–232 data streams with transmission rates from 50 bps to 2048 Mbps (T1). The KIV–7HSB is fully compatible with the KG–84 families of encryption devices (i.e. KG–84A/C, KIV–7). NSA has endorsed the KIV–7HSB for encryption of Type 1 encryption of data up to Top Secret level. Further details concerning the KIV-7HSB are located at http://www.mykotronx.com/.

3.2.3.1.2.1 KIV-7HSB Crypto Fill Port

The KIV-7HSB fill interface is compatible with both DS-101 (AN/CYZ-10 DID) and DS-102 (KYK-13, KYX-15, KOI-18) electronic keying, devices. Storage for up to ten traffic encryption keys simplifies multi-net communication. A removable Crypto-Ignition Key (CIK) prevents unauthorized access and protects all of the internally stored keys. Advanced key management features support the current key distribution system and can be adapted for the emerging Electronic Key Management System (EKMS), while providing the added flexibility necessary for managing operational keys.

3.2.3.1.3 KIV–7HSB Encryptor Frame

The KIV-7 Frame Model 3014-2 provides both electrical and mechanical interfaces for two KIV-7 modules, 19-inch rack mounted. It provides easy access for installation and removal of units. A built-in power supply permits operation from standard line power.

3.2.3.1.4 NRZ to CDI Converter

The DNE CV-8448-D provides conversion of NRZ serial data from the KIV–7HSB to a Conditioned Diphase signal for connection to TRI-TAC communications equipment. The CV-8448-D provides:

- Signal conversion from EIA–530 interfaces to CDI or fiber optic
- Balanced or unbalanced signals (depending on software configuration) over WF–16/U or equivalent field wire using binding post terminations
- Unbalanced signals over BNC coax terminations
- Fiber optic signals using ST connectors
- Interface to KIV–7HSB and TRI-TAC equipment
- Modular converter supports two converter modules. The CV-8448-D can be mated to another CV-8448-D via an expansion port to form a four-channel configuration that may be controlled from a single terminal interface.

Full equipment specifications can be found at http://www.dnetech.com/ .

3.2.3.2 Configuration Options (Kits)

Many of the system level and maintenance kits can be used for module enchancement, troubleshooting, testing, and repair. These kits include:

- Cable Maintenance Kit
- Circuit Extension Kit
- Crypto Configuration Kit
- Fiber Cable Kit
- Fireberd Analyzer Kit
- Laptop Computer Kit
- Large UPS Kit
- Router Kit
- Small UPS Kit
- Printer Kit
- Voice/Data Cable Kit

3.2.4 Physical Characteristics

3.2.4.1 Transit Case

The module is housed in an 11U man-transportable container (transit case), approximately 22.5”W x 34.5”D x 23.4”H. The transit case is designed to stack on top of and mechanically interlock to like cases. The frame inside the transit case is designed to slide out of the case to allow removal and replacement of Line-Replaceable-Units in the field. It is designed (with covers

in place) to protect the electronic equipment inside from direct exposure to environmental conditions; e.g., rain, snow, ice, dust, etc., likely to be encountered during world wide military transit.

3.2.4.2 Weight

The Crypto Interface Module, including all internally carried cables, does not exceed TBD.

3.2.4.3 Storage Space

The Crypto Interface Module includes storage pouches within its covers to contain cables, manuals, etc. that must be transported and used with the module.

3.2.4.4 Marking

See TDC Standards Document for required markings.

3.2.5 Cables and Accessories

The module includes cables listed in Table 10, stored within its covers. Unique cables shall be marked with the modules Red and White color code as indicated.

Table 10 - Cables and Terminators included with CIM

Function	Color Code	Quantity	Description
Power	Red/Wht	1	IEC–320 receptacle to NEMA 5–15P.
Cable Mgmt Bar	Red/Wht	1	Metal Clad Horizontal Bar for 19” Racks
Cable Loop	Red/Wht	1	Saddle PolyTie with 10/32 Metal Rack Screw (10 pack)
Strain Relief	Red/Wht	1	Rack and frame cable management
Router to KIV Red Jumper Cable P1	Red/Wht	4	Straight-thru DB-25M – DB-25M cables (1 ft)
Black I/O Jumper Cable P2	Red/Wht	4	EIA-530 Shielded Cable, DB-25M – DB-25M (3 ft)
IP Backbone Cable P3	Red/Wht	2	Multimode fiber optic, 2 fibers, ST to ST connectors (20ft)
Configuration Cable P4	Red/Wht	1	EIA–232 control cable w/ DB–9F to DB–9M connectors for PC COM port (10 ft)
Patch Cable P5	Red/Wht	4	Straight-thru DB-25M – DB-25M cables (10 feet long)
10/100BaseTX to 100BaseFX	Red/Wht	1	Bridging Media Converter

Table 10 - Cables and Terminators included with CIM

Function	Color Code	Quantity	Description
Media Converter Cable P6	Red/Wht	1	6 ft, RJ-45, Crossover Cable

3.2.6 Reliability

The CIM v2.2 with its standard complement of LRUs, have a mean time between failure (MTBF) commensurate with similar commercial equipment in its class. The actual MTBF for the major system components are shown in Paragraph 11. Where reliability data is not readily available from the vendor, this is indicated.

Table 11 - MTBF of Major Components

Component	MTBF
Cisco 3745 Router	20,000 to 50,000 hours
CV-8448-D	Not Available
KIV-7HSB Encryptor	>77,000 hours at 25C
KIV-7 Frame	Not Available

3.2.7 Maintainability

Maintainability characteristics will be part of the selection criteria for all hardware. Ease of maintenance, such as accessibility to Line Replaceable Units, fault detection/isolation software capability, and fault annunciation will be considered.

3.2.7.1 Mean Time Between Preventive Maintenance

The Mean Time Between Preventive Maintenance, during operation, is 30 days. The duration of preventive maintenance actions such as corrosion control, cleaning filters, etc., does not exceed 30 minutes.

3.2.8 Environmental Conditions

During storage, transport and operation the modules can withstand exposure to temperatures as shown in Table 12.

3.2.8.1 Temperature

Temperature characteristics for the major equipment components are shown in Table 12.

Table 12 - Module Temperature Characteristics

Equipment	Temperature (degrees C)	
	Operating	Non-Operating
Cisco 3745 Router	0 to 40	-25 to 70
CV-8448-D	0 to 50	-20 to 65
KIV-7HSB Encryptor	0 to 55	-40 to 85
KIV-7 Frame	-40 to 55	Not Available

3.2.8.2 Relative Humidity

Relative humidity characteristics for the major equipment components are shown in Table 13.

Table 13 - Module Humidity Characteristics

Equipment	Humidity
	Non-condensing
Cisco 3745 Router	5 to 95%
CV-8448-D	0 to 95%
KIV-7HSB Encryptor	10 to 90%
KIV-7 Frame	0 tp 90%

3.2.8.3 Altitude

Altitude characteristics for the major equipment components are shown in Table 14.

Table 14 - Module Altitude Characteristics

Equipment	Altitude (feet)	
	Operating	Non-Operating
Cisco 3745 Router	10,000	Not Available
CV-8448-D	15,000	40,000
KIV-7HSB Encryptor	Not Available	Not Available
KIV-7 Frame	Not Available	Not Available

3.2.8.4 Sand and Dust

During storage and transport, the modules are protected when exposed to sand and dust in accordance with the best commercial practices for close proximity to operating aircraft. During operation with covers removed, the modules can withstand sand and dust in accordance with the best commercial practices for natural conditions.

3.2.8.5 Shock

Module equipment racks are equipped with rubber shock isolation mounts and is protected from shocks induced during handling, setup and tear down. Modules and components can operate without degradation following exposure to the non-operating shock environment described by Method 516.5, Procedure VI (Bench Handling) of MIL STD 810F.

3.2.8.6 Vibration

The modules are equipped with rubber shock isolation mounts so that the modules can withstand the vibration encountered while being transported by commercial and military airlift, sealift and vehicular (over unimproved roads) systems. MIL-STD-810F, Method 514.5, Procedure I, Categories 4, 7 and 8. applies; alternative procedures may be substituted after TDC Program Office approval.

3.3 Design and Construction

3.3.1 Material Parts and Processes

This module is built to good commercial practices. Mechanical and electrical interchangeability exists between like systems, subsystems, assemblies, subassemblies and replaceable parts.

3.3.2 Safety

This module shall not present a safety, fire or health hazard to personnel.

3.3.2.1 Electrical Safety

This module is designed to eliminate the hazard to personnel of inadvertent lethal voltage contact. All electrical conductors carrying voltages in excess of 70 volts shall be insulated to prevent contact or covered by a protective barrier. All removable protective barriers shall be interlocked to automatically disconnect power behind the barrier upon removal or clearly marked with a warning label that indicates the voltage potential that will be encountered behind the barrier. All warning labels shall remain visible after the cover has been removed.

3.3.2.2 Mechanical Safety

Sharp surfaces shall have protective covers or other suitable features to minimize injury where personnel are likely to be exposed to such surfaces.

3.4 Logistics

This module accommodates a two level maintenance concept: organizational (Air Force personnel) and depot (contractor personnel). Removal and replacement of an LRU is defined at the organizational level and any needed repair of the LRU is defined at the depot level. Any special test or support equipment required to effect removal or replacement of an LRU at the

organizational level can be provided as part of the module. No more than two persons shall be required to remove or replace an LRU.

An LRU is defined as the lowest element of the module which can be isolated to be faulty through inspection; built-in test; technical manuals; TDC-ICAP system performance; spares substitution; or other diagnostic aid approved by the Government for organizational level maintenance, exclusive of expendables such as fuses, lamps and LEDs. An LRU is defined at the card/module level or higher.

4.0 QUALITY ASSURANCE PROVISIONS

4.1 General

The quality assurance program includes tests and other evaluations to the extent specified herein. The quality assurance program is designed to verify the electrical, mechanical and functional characteristics of each module. The purpose is to ensure that each module complies with or performs better than the requirements specified herein.

4.2 Responsibility for Inspection

Unless otherwise specified in the contract, the contractor shall be responsible for the performance of all inspection requirements and may use his own or any other facilities suitable for the performance of the inspection requirements. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to the prescribed requirements.

4.3 Product Qualification Test (PQT)

Inspections, analyses, demonstrations and tests verify compliance of Section 3 of this specification on the first production unit.

4.4 Production Acceptance Test (PAT)

Each module delivered to the Government undergoes an Acceptance Test Process as identified in Table 15. The acceptance test verifies that the module interfaces are operating properly prior to delivery to the Government.

4.5 Verification Cross Reference Matrix (VCRM)

Table 15 provides a list of each Section 3 requirement and the verification method to be used. The following paragraphs define the codes employed in the VCRM. Unless otherwise noted, where more than more one verification method is shown, one method or a combination of methods may be used to show compliance.

4.5.1 Not Required (N/R)

This method indicates that verification is not required because the paragraph is a title, heading, general introductory paragraph or statement of a goal and contains no “shall” or “must” statements.

4.5.2 Inspection

Inspection is a method of verification of the module performance or characteristics by examination of the equipment or associated documentation. Inspections are conducted with the use of inspection tools, measurement devices, visual means and comparison. Most inspections apply to verification of requirements associated with physical characteristics such as size, weight,

appearance, adherence to specified standards and engineering practices, quality design, and construction supported with quality documentation. Inspections also include the auditing of manufacturer's data that verifies the performance of non-developmental items that comprise the TDC ICAP module. Inspections may occur during any assembly stage of the unit under test.

4.5.3 Analysis

Analysis is a method of verification through technical evaluation of calculations, computations, models, analytical solutions, use of studies, reduced data, and/or representative data to determine that the item conforms to the specified requirements.

4.5.4 Demonstration

Demonstration is a method of verification whereby the properties, characteristics and parameters of the item are determined by observation alone and without the use of instrumentation for quantitative measurements. This method is used when a requirement does not contain a specific numerical parameter that must be measured. Demonstrations may occur during verification of a unit under test at any assembly stage. Pass/fail criteria are simple yes/no indications of functional performance since no quantitative values are specified.

4.5.5 Test

Test is a method to verify that a specified requirement is met by thoroughly exercising the applicable item under specified conditions and by using the appropriate instrumentation in accordance with test procedures. This method requires the use of laboratory equipment, simulators, or services to verify compliance to the specified requirements. This method is used when it is practicable to make direct or indirect measurement of a specified numerical parameter to verify compliance with a requirement. Tests may occur during verification of a unit at any assembly stage. Actual measured values are recorded, and pass/fail is determined by comparing the measured value with the specified value. Measurement accuracy is precise enough to ensure that the measured value is within the specified tolerance.

Table 15 - Verification Cross Reference Matrix

		Verification Method					
			PQT				
Paragraph	Title	N/R	Inspect	Analysis	Demo	Test	ATP
3.0	Requirements	X					
3.1	Module Definition	X					
3.2	Performance Requirements	X					
3.2.1	Electrical Interface Requirements (External)	X					
3.2.1.1	Prime Power					X	X
3.2.1.2	10/100BaseTX (0/0,0/1)				X		X
3.2.1.3	100BaseFX (1/0, 2/0 ST Fiber Optic Pair)				X		X

Table 15 - Verification Cross Reference Matrix

Paragraph	Title	Verification Method					
			PQT				
		N/R	Inspect	Analysis	Demo	Test	ATP
3.2.1.4	Serial Router Ports (3/0-3/3)				X		X
3.2.1.5	KIV-7HSB Plain Text - Red Interface (1-4)				X		X
3.2.1.6	KIV-7HSB Cipher Text - Serial Data (1-4)				X		X
3.2.1.7	CV-8448-D Input - EIA-530 Serial Data (1-4)				X		X
3.2.1.8	CV-8448-D Input - External Clock In (1-4)				X		X
3.2.1.9	CV-8448-D Output				X		X
3.2.1.9.1	Binding Post (CV-8448 Port 1-2)				X		X
3.2.1.9.2	BNC Connections				X		X
3.2.1.9.3	ST Connections				X		X
3.2.1.10	Operator Interface - Configuration Ports (Router and CV-8448-D)				X		X
3.2.1.11	Crypto Fill Port				X		X
3.2.2	Electrical Interface (Internal)	X					
3.2.3	Functional Requirements	X					
3.2.3.1	Module Equipment Details	X					
3.2.3.1.1	Cisco 3745 Modular Router				X		X
3.2.3.1.1.1	Router Software				X		X
3.2.3.1.1.2	Router Administration				X		X
3.2.3.1.2	KIV-7HSB Encryptor				X		X
3.2.3.1.2.1	KIV-7HSB Encryptor Frame				X		X
3.2.3.1.3	KIV-7HSB Crypto Fill Port				X		X
3.2.3.1.4	NRZ to CDI Converters				X		X
3.2.3.2	Configuration Options (Kits)	X					
3.2.4	Physical Characteristics	X					
3.2.4.1	Transit Case		X				
3.2.4.2	Weight					X	
3.2.4.3	Storage Space		X				
3.2.4.4	Marking		X				
3.2.5	Cables And Accessories				X		X
3.2.6	Reliability			X			
3.2.7	Maintainability			X			
3.2.7.1	Mean Time Between Preventive Maintenance [MTBPM]			X			
3.2.8	Environmental Conditions	X					

Table 15 - Verification Cross Reference Matrix

Paragraph	Title	Verification Method					
			PQT				
		N/R	Inspect	Analysis	Demo	Test	ATP
3.2.8.1	Temperature					X	
3.2.8.2	Humidity			X			
3.2.8.3	Altitude			X			
3.2.8.4	Sand And Dust			X			
3.2.8.5	Shock					X	
3.2.8.6	Vibration					X	
3.3	Design And Construction	X					
3.3.1	Material Parts And Processes			X			
3.3.2	Safety	X					
3.3.2.1	Electrical Safety			X		X	
3.3.2.2	Mechanical Safety		X	X			
3.4	Logistics			X			

5.0 PREPARATION FOR DELIVERY

Each module is packaged for shipment and the package marked in accordance with the requirements of the contract under which the module is ordered.

6.0 BASELINE CONFIGURATION

6.1 Equipment

Table 16 - Equipment Listing

Device	Manufacturer	Part Number	Descritpion	Quantity
Router Unit	Cisco	Cisco3745	Cisco 3RU-4 Slot Router	1
Router Module	Cisco	NM-4T	Serial Network Module 4-Port	1
Router Module	Cisco	NM-1FE-FX-V2	100BaseFX	2
Trunk Encryptor – Low Speed	Mykotronx	4090500-0501	KIV-7HSB Encryptor	4
KIV–7HSB	Mykotronx	KIV–7HSB Firmware	Rev K	-
Mounting Frame	Pulse Eng	3014-2 (110/220)	Autosensing KIV-7 Mounting Frame	2
NRZ – CDI Converter	DNE	97370010	Multi-mode NRZ-CDI Converter CV-8448-D	1
Connector	Fiber Systems Intl	BSTA2000	Bulkhd Coup	8
Connector	Gruber IND Inc	80-3029	RJ-45 Feedthru	2
Connector	Connector Tech Inc	M55339/13-00492	BNC Bulkhd Adaptor	6
Conditioner	Marway	411355	Power Conditioner	1
Case	ECS Composites	11721	Transit Case (11U)	1
Cable Mgnt	Leviton Telcom	41150-019	Metal Clad Horizontal Bar for 19” Racks	2
Cable Loop	Leviton Telcom	41020-SPR	Saddle PolyTie with 10/32 Metal Rack Screw (10 pack)	2
(W1, W2) Cables	TBD	TBD	10/100BaseTX Cable - Cisco 3745 to I/O Panel	2
(W3, W4) Cables	TBD	TBD	100BaseFX Cable – 3745 Router to I/0 Panel	2
(W5) Cable	TBD	TBD	Operator Interface Cable – Cisco 3745 CON to I/O Panel	1
(W9) Cable	TBD	TBD	Operator Interface Cable – CV-8448-D I/O Panel	1
(W10) Cable	TBD	TBD	IEC – 320 Type Power Cord	1
(W11 – W14) Cables	TBD	TBD	EIA-530 Serial Cable – Cisco 3745 to I/O Panel	4
(W15 – W18) Cables	TBD	TBD	KIV Plain Text Cable – I/O Panel to KIV-7HSB J3	4
(W19 – W22) Cables	TBD	TBD	KIV Cipher Text – KIV-7HSB J2 to I/O Panel	4
(W23, W24) Cables	TBD	TBD	CV-8448-D NRZ Interface to I/O Panel	2

Table 16 - Equipment Listing

Device	Manufacturer	Part Number	Descritpion	Quantity
(W25, W26) Cables	TBD	TBD	Multimode fiber optic, 2 fibers, ST to ST connectors	2
(W27, W28) Cables	TBD	TBD	CV-8448-D CDI Binding Post I/O (Balanced)	2
(W29, W30, W31, W32) Cables	TBD	TBD	CV-8448-D CDI BNC I/O (Unbalanced)	4
(W33, W34) Cables	TBD	TBD	CV-8448-D EXT CLK BNC	2
(W35 – W37) Cables	TBD	TBD	IEC–320 receptacle to NEMA 5–15P.	3
(P1) Router to KIV Red Jumper Cable	TBD	TBD	Straight-thru DB-25M – DB-25M cables (Stored in pouch) 1 ft	4
(P2) Black I/O Jumper Cables	TBD	TBD	EIA-530 Shielded Cable, DB-25M – DB-25M (Stored in pouch) 3 ft	4
(P3) TBD	TBD	TBD	Multimode fiber optic, 2 fibers, ST to ST connectors (Stored in pouch) 20 ft	2
(P4) TBD	TBD	TBD	EIA–232 control cable w/ DB–9F to DB–9M connectors for PC COM port (Stored in pouch) 10 ft	1
(P5) Patch Cable	TBD	TBD	Straight-thru DB-25M – DB-25M cables 10 feet long	4
10/100BaseTX to 100Base FX	Transition Networks	SBFTF1011-100	Bridging Media Converter (Stored in Pouch)	1
(P6) Media Converter Cable	TBD	TBD	6ft, RJ-45, Crossover Cable	1

6.2 Elevation Drawings

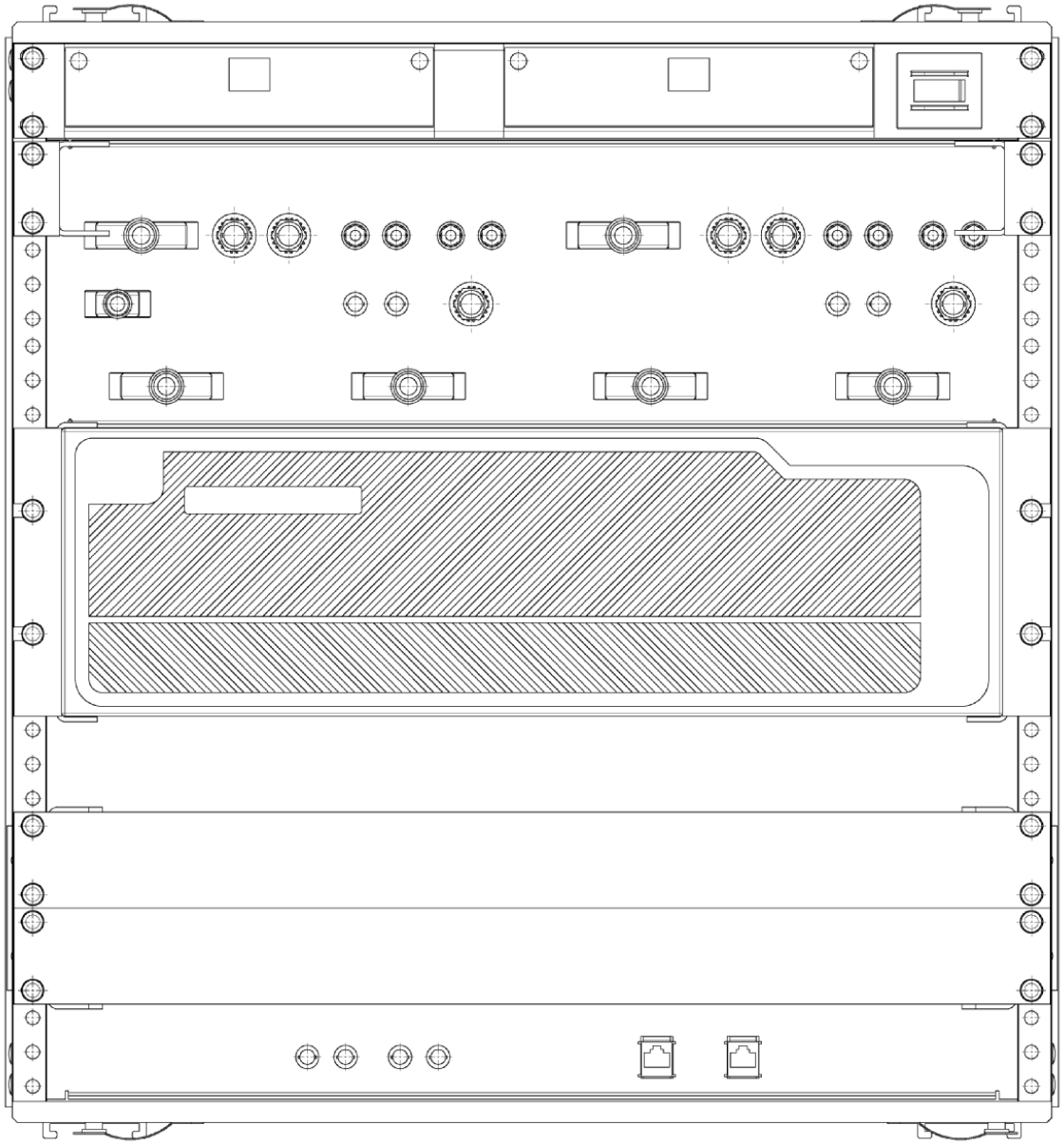


Figure 2 - Front Elevation

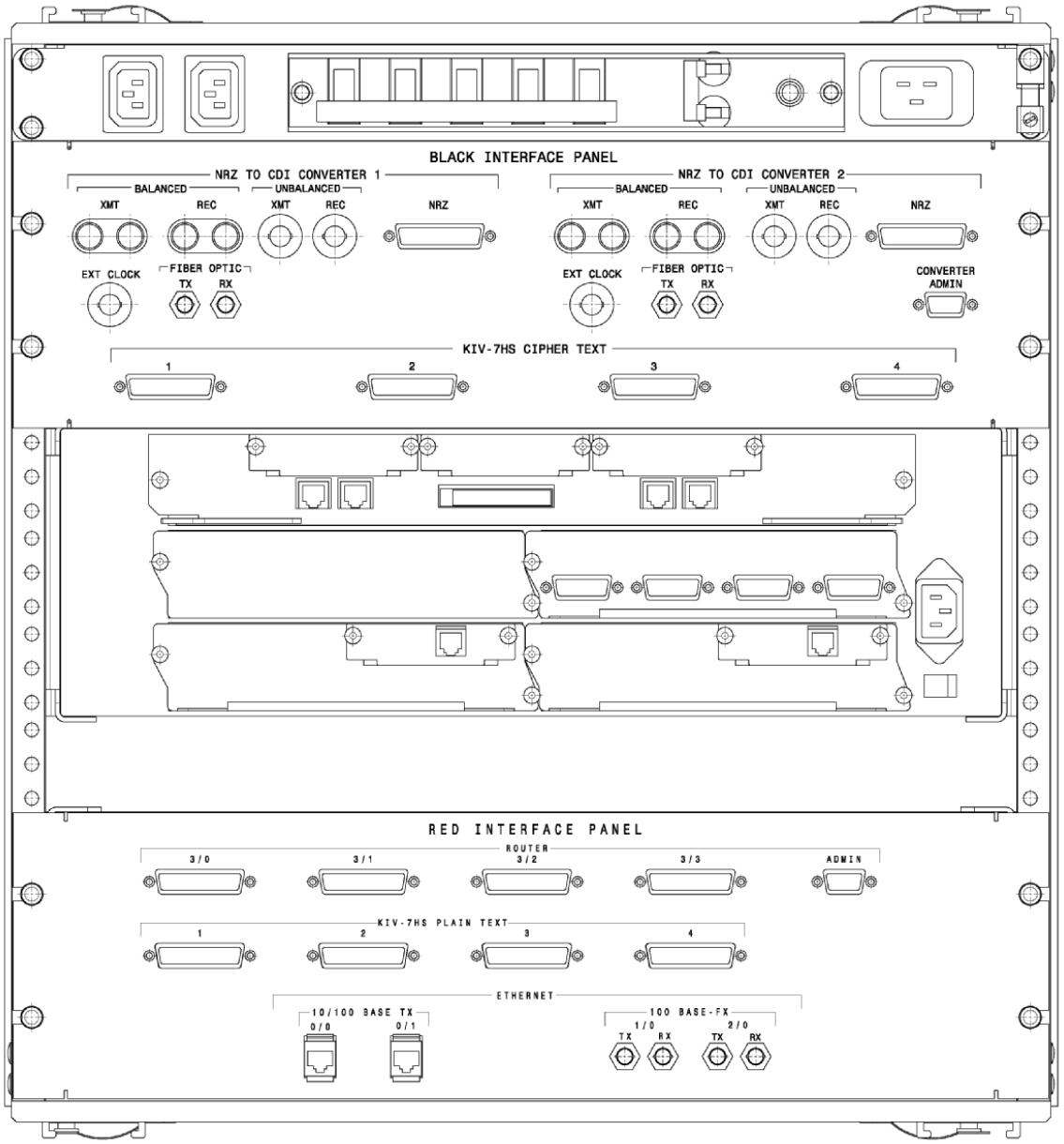


Figure 3 - Rear Elevation

6.3 Cable Diagrams

Table 17 - Cable Diagrams

Wire Number	Manufacturer	Part Number	Description
(W1, W2) Cables	TBD	TBD	10/100BaseTX Cable – Cisco 3745 to I/O Panel
(W3, W4) Cables	TBD	TBD	100BaseFX Cable – 3745 Router to I/0 Panel
(W5) Cable	TBD	TBD	Operator Interface Cable – Cisco 3745 CON to I/O Panel
(W9) Cable	TBD	TBD	Operator Interface Cable – CV-8448-D I/O Panel
(W10) Cable	TBD	TBD	IEC – 320 Type Power Cord
(W11 – W14) Cables	TBD	TBD	EIA-530 Serial Cable – Cisco 3745 to I/O Panel
(W15 – W18) Cables	TBD	TBD	KIV Plain Text Cable – I/O Panel to KIV-7HSB J3
(W19 – W22) Cables	TBD	TBD	KIV Cipher Text – KIV-7HSB J2 to I/O Panel
(W23, W24) Cables	TBD	TBD	CV-8448-D NRZ Interface to I/O Panel
(W25, W26) Cables	TBD	TBD	Multimode fiber optic, 2 fibers, ST to ST connectors
(W27, W28) Cables	TBD	TBD	CV-8448-D CDI Binding Post I/O (Balanced)
(W29 – W32) Cables	TBD	TBD	CV-8448-D CDI BNC I/O (Unbalanced)
(W33, W34) Cables	TBD	TBD	CV-8448-D EXT CLK BNC
(W35 – W37) Cables	TBD	TBD	IEC–320 receptacle to NEMA 5–15P.
(P1) Router to KIV Red Jumper Cable	TBD	TBD	Straight-thru DB-25M – DB-25M cables (Stored in pouch)
(P2) Black I/O Jumper Cables	TBD	TBD	EIA-530 Shielded Cable, DB-25M – DB-25M (Stored in pouch)
(P3) IP Backbone Cable	TBD	TBD	Multimode fiber optic, 2 fibers, ST to ST connectors (Stored in pouch)
(P4) Configuration Cable	TBD	TBD	EIA–232 control cable w/ DB–9F to DB–9M connectors for PC COM port (Stored in pouch)
(P5) Patch Cable	TBD	TBD	EIA-530 Sheilded Cable DB-25M – DB 25M 10 feet long (Stored in Pouch)
(P6) Patch Cable	TBD	TBD	6 ft, RJ-45 Crossover Cable

Cable W1, W2
10/100BaseTX Cable - Cisco 3745 to I/O Panel
Pin Assignments

RJ45 Cisco 3745	Signal	RJ45 I/O Panel
1	TP0+	1
2	TP0-	2
3	TP1+	3
4	TP2+	4
5	TP2-	5
6	TP1-	6
7	TP3+	7
8	TP3-	8

Cable W3, W4
Pin Assignments
100BaseFX Cable – 3745 Router to I/0 Panel

SC PLUG	Signal	Direction	ST PLUG I/O Panel
1	TX	---->	1
2	RX	<----	2

Cable W5
Operator Interface Cable – Cisco 3745 CON to I/O Panel
Pin Assignments

RJ45 Plug Cisco 3745 Console Port	Signal	Direction	DB09F Plug I/O Panel
1	RTS	-----	8
2	DTR	→	6
3	TxD	→	2
4	GND	-----	5
5			
6	RxD	←	3
7	DSR	←	4
8	CTS	-----	7

Cable W9
Operator Interface Cable – CV-8448-D I/O Panel
Pin Assignments

DB9F Plug CV-8448-D	Signal	Direction	DB9F Plug I/O DF
(RxD) 2	TxD	←	2 (TxD)
(TxD) 3	RxD	→	3 (RxD)
(GND) 5	GND	-----	5 (GND)

Cable W10
IEC – 320 Type Power Cord
Pin Assignments

IEC-320 Receptacle Power	Signal	Direction	IEC-320 Plug Power Conditioner- A1 Power
1	Line	-----	1
2	Neutral	-----	2
3	GND	-----	3

Cable W11-W14
EIA530 Serial Cable – Cisco 3745 to I/O Panel
Pin Assignments

DB60M Plug C3745 NM-4T Serial Port 0-3			DB25F Plug I/O Panel
	Signal	**Direction**	
J1-11	TxD+	→	2
J1-12	TxD-	→	14
J1-28	RxD+	←	3
J1-27	RxD-	←	16
J1-9	RTS+	→	4
J1-10	RTS-	→	19
J1-1	CTS+	←	5
J1-2	CTS-	←	13
J1-3	DSR+	←	6
J1-4	DSR-	←	22
J1-46	Shield_GND	Shorted to J1-47	1
J1-47	Mode_2	Shorted to J1-46	-
J1-48	GND	Shorted to J1-49	-
J1-49	Mode_1	Shorted to J1-48	-
J1-5	DCD+	←	8
J1-6	DCD-	←	10
J1-24	TxC+	←	15
J1-23	TxC-	←	12
J1-26	RxC+	←	17
J1-25	RxC-	←	9
J1-44	LL	←	18
J1-45	Circuit_GND	-----	7
J1-7	DTR+	→	20
J1-8	DTR-	→	23
J1-13	TxCE+	→	24
J1-14	TxCE-	→	11
J1-51	GND	Shorted to J1-52	-
J1-52	Mode_DCE	Shorted to J1-51	-

Cable W15-W18
KIV Plain Text Cable – I/O Panel to KIV-7HSB J3
Pin Assignments

DB25F Plug I/O Panel	Signal	Direction	DB37M Plug KIV-7HSB J3
2	TxD+	→	2
14	TxD-	→	14
3	RxD+	←	3
16	RxD-	←	16
15	TxC+	←	15
12	TxC-	←	12
17	RxC+	←	17
9	RxC-	←	9
7	Circuit Ground	-----	7
23	DTR-/SyncTX-P	→	31
18	LL	→	18
5	CTS+	←	
6	DSR+		
8	DCD+		
13	CTS-	←	
22	DSR-		
10	DCD-		
	RTS+		4
	DTR+		20
	+5VDC		28
	-6VDC		36
	DTR-		23
	RTS-		19

Cable W19-W22
KIV Cipher Text – KIV-7HSB J2 to I/O Panel
Pin Assignments

DB37F Receptacle KIV-7HSB	Signal	Direction	DB25F Receptacle I/O Panel
2	TxD+	→	2
14	TxD-	→	14
3	RxD+	←	3
16	RxD-	←	16
4	RTS+	→	4
19	RTS-	→	19
15	TxC+	←	15
12	TxC-	←	12
17	RxC+	←	17
9	RxC-	←	9
7	GND	←	7
20	DTR+	→	20
23	DTR-	→	23
24	TxCE+	→	24
11	TxCE-	→	11
25			25
28	+5VDC	→	
5	CTS+	←	
6	DSR+	←	
8	DCD+	←	
36	-6VDC	→	
13	CTS-	←	
22	DSR-	←	
10	DCD-	←	

Cable W23-W24
CV-8448-D NRZ Interface to I/O Panel
Pin Assignments

DB25F Plus I/O Panel	Signal	Direction	DB25M Plug CV-8448-D NRZ I/O
1	Shield	-----	1
2	TxD+	→	2
3	RxD+	←	3
4	NC	-----	4
5	NC	-----	5
6	NC	-----	6
7	Signal GND	-----	7
8	DCD (CF) +	-----	8
9	RxC-	←	9
10	DCD (CF) -	-----	10
11	TxCi-	→	11
12	TxCo-	←	12
13	NC	-----	13
14	TxD-	→	14
15	TxCo+	←	15
16	RxD-	←	16
17	RxCo+	←	17
18	NC	-----	18
19	NC	-----	19
20	NC	-----	20
21	NC	-----	21
22	NC	-----	22
23	NC	-----	23
24	TxCi+	→	24
25	NC	-----	25

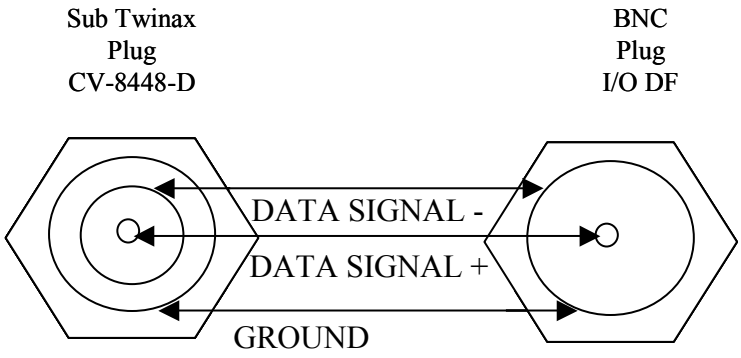
Cable W25-W26
CV-8448-D Fiber Optic Output
Pin Assignments

ST Plug Dual T1 FO Modem A4	Signal	Direction	ST Plug Optical Scan 0 & 1 Interface Panel A7
1	Tx	→	1
2	Rx	←	2

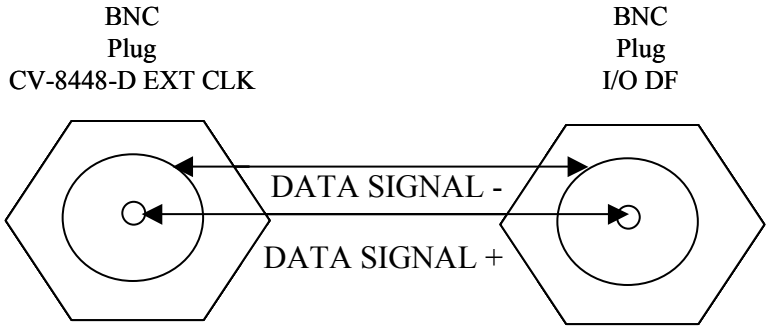
Cable W27-W28
CV-8448-D CDI Binding Post I/O (Balanced)
Pin Assignments

DB09M Plug CV-8448-D NRZ I/O	Signal	Direction	Binding Post I/O DF
6	TxD+	→	Red
7	TxD-	→	Black
1	RxD+	←	Red
2	RxD-	←	Black

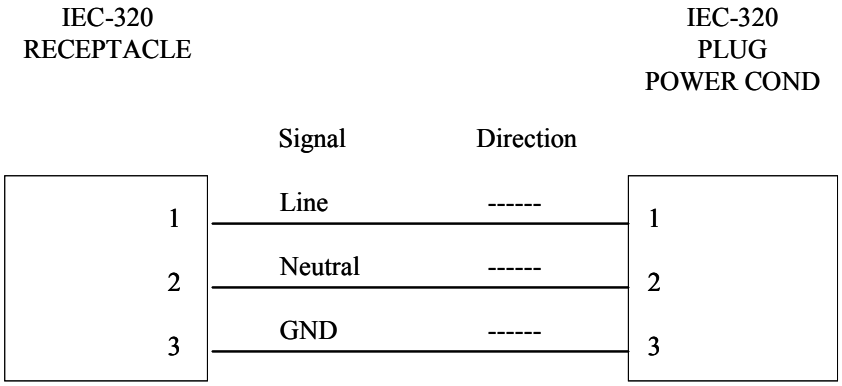
Cable W29-W32
CV-8448-D CDI BNC I/O (Unbalanced)
Pin Assignments



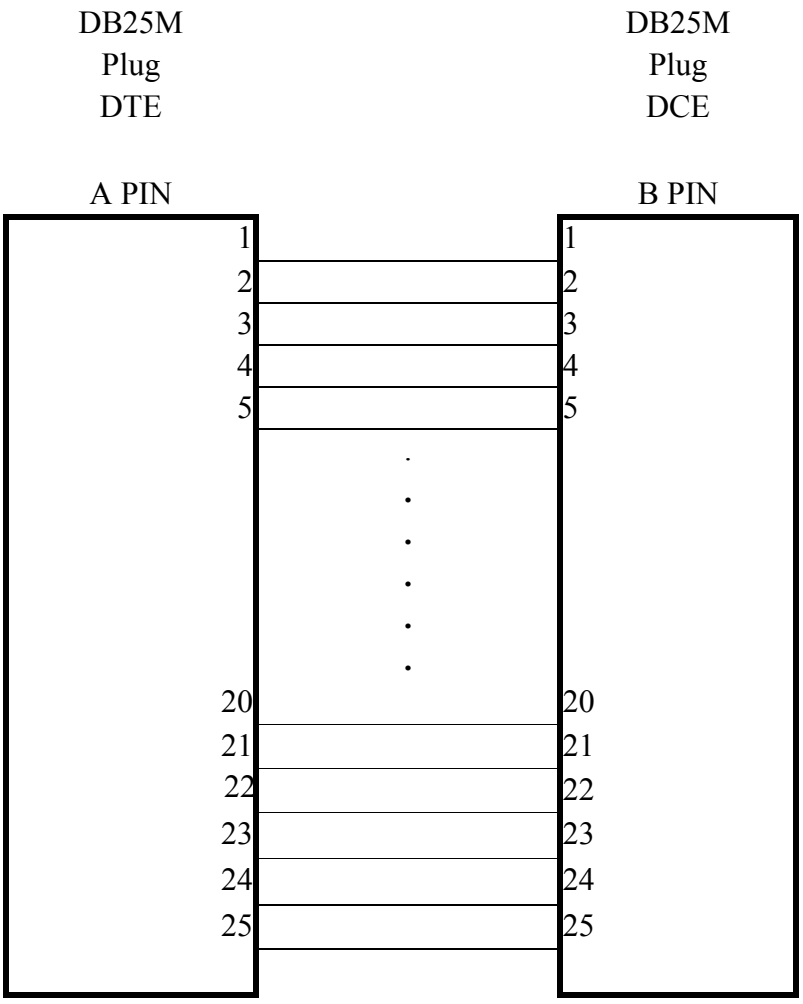
Cable W33-W34
CV-8448-D EXT CLK BNC
Pin Assignments



Cable W35-W37
IEC – 320 Type Power Cord
Pin Assignments



Cable P1, P2, P4
Straight-thru DB-25M – DB-25M cables
(Stored in pouch)



Note: Pinout is 1:1 straight–thru cable 25 pins

Cable P3

Multimode fiber optic, 2 fibers, ST to ST connectors (stored in pouch)

Pin Assignments

ST Plug			ST Plug
	Signal	**Direction**	
1	Tx	→	1
2	Rx	←	2

Cable P5

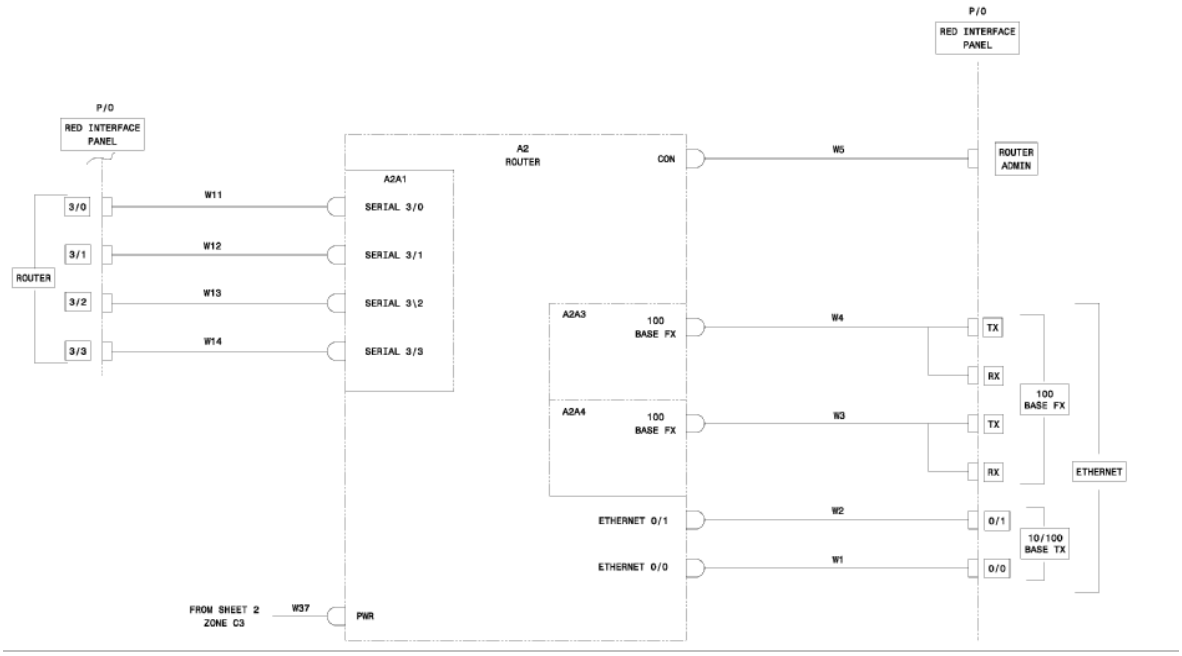
EIA–232 control cable w/ DB–9F to DB–9M connectors for PC COM port

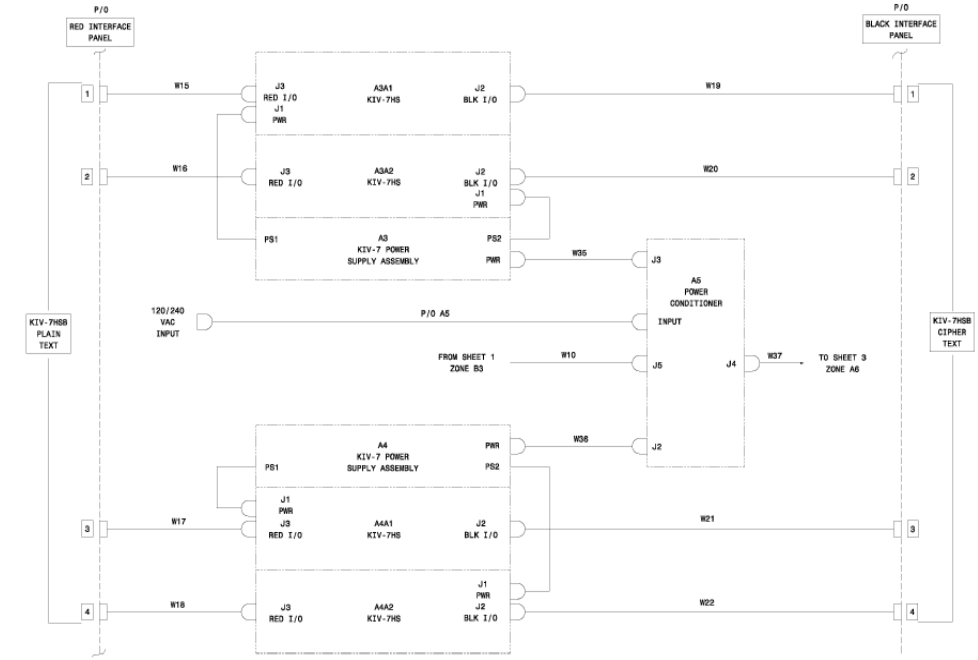
(Stored in pouch)

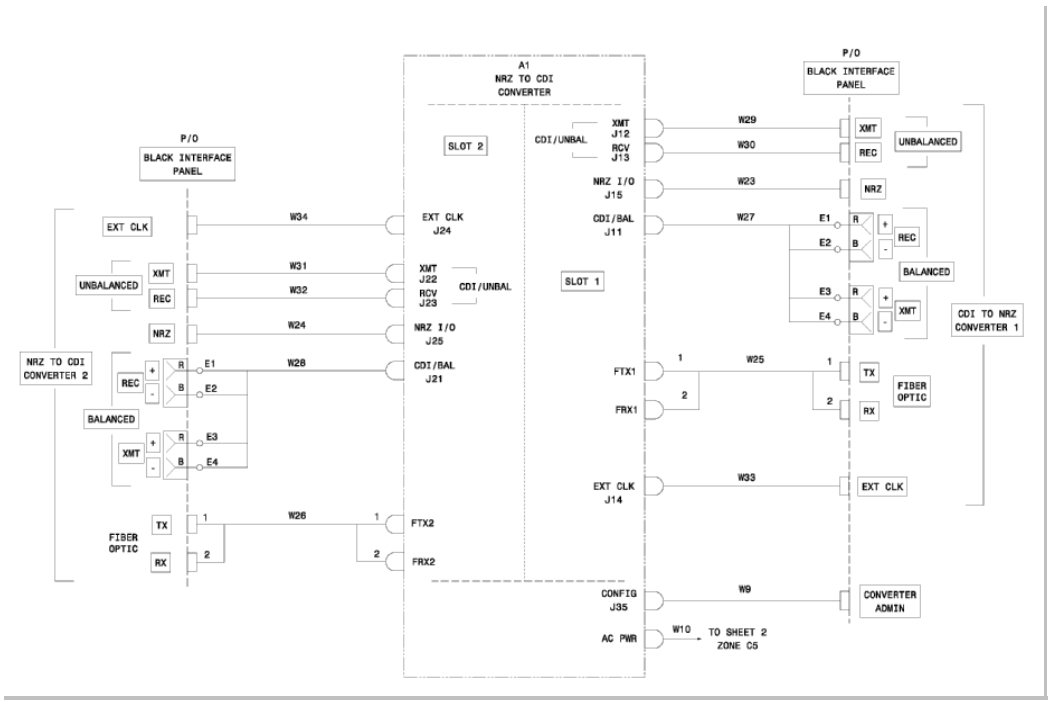
Pin Assignments

DB9F Plug Laptop COM port Terminal DTE			DB9M Receptacle I/O DF Various Admin
	Signal	**Direction**	
1	N/C		1
2	RD	→	2
3	TD	←	3
4	DTR	→	4
5	GND	----	5
6	DSR	←	6
7	RTS	→	7
8	CTS	←	8
9	N/C		9

6.4 Interconnection Diagrams




P/O
RED INTERFACE
PANEL
P/O
BLACK INTERFACE
PANEL
W15
W16
W17
W18
W19
W20
W21
W22
J3
RED I/O
J1
PWR
A3A1
KIV-7HS
J2
BLK I/O
A3A2
KIV-7HS
A3
KIV-7 POWER
SUPPLY ASSEMBLY
PS1
PS2
PWR
W35
J3
A5
POWER
CONDITIONER
INPUT
120/240
VAC
INPUT
P/O A5
KIV-7HSB
PLAIN
TEXT
KIV-7HSB
CIPHER
TEXT
FROM SHEET 1
ZONE B3
W10
J5
J4
W37
TO SHEET 3
ZONE A6
A4
KIV-7 POWER
SUPPLY ASSEMBLY
W36
J2
A4A1
KIV-7HS
A4A2
KIV-7HS


A1
NRZ TO CDI
CONVERTER
SLOT 2
SLOT 1
CDI/UNBAL
XMT
J12
RCV
J13
NRZ I/O
J15
CDI/BAL
J11
EXT CLK
J24
XMT
J22
RCV
J23
NRZ I/O
J25
CDI/BAL
J21
FTX1
FRX1
EXT CLK
J14
CONFIG
J35
AC PWR
W10
TO SHEET 2
ZONE C5
P/O
BLACK INTERFACE
PANEL
P/O
BLACK INTERFACE
PANEL
W29
W30
W23
W27
W34
W31
W32
W24
W28
W25
W33
W26
W9
XMT
REC
NRZ
UNBALANCED
BALANCED
EXT CLK
UNBALANCED
XMT
REC
NRZ
REC
BALANCED
XMT
NRZ TO CDI
CONVERTER 2
FIBER
OPTIC
TX
RX
TX
RX
FIBER
OPTIC
CONVERTER
ADMIN
CDI TO NRZ
CONVERTER 1
R
B
E1
E2
E3
E4
FTX2
FRX2